

4.

The Templeton Crocker Expedition. IV. Porcellanid Crabs
from the Gulf of California.¹

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(Plate I).

[Note: This is the fourth of a series of papers dealing with the specimens collected on the Twenty-fourth or Templeton Crocker Expedition of the Department of Tropical Research of the New York Zoological Society; William Beebe, Director. For data on dredges, localities, dates, etc., concerning the capture of specimens treated in this paper, refer to the present volume of *Zoologica*, No. 2, pp. 33 to 46.]

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INTRODUCTION.

This interesting collection of porcellanids from the Gulf of California comprises 11 species in 4 genera. New locality records are noted, extending the known ranges of several species both geographically and bathymetrically.

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Two new species are described, both being collected at the same time and place, in shallow water. Also, new types are proposed for *Pachycheles biocellatus* (Lockington), as the original types for this species are not extant.

Family PORCELLANIDAE.

Genus *Petrolisthes* Stimpson.

Petrolisthes hirtispinosus Lockington.

Petrolisthes hirtispinosus Lockington, *Ann. Mag. Nat. Hist.*, ser. 5, vol. 2, 1878, p. 400 (type-locality, Mulege Bay, Gulf of California, Mexico; type not extant), (not *Petrolisthes edwardsii* Saussure).

"*Petrolisthes hirtispinosus* ? Lockington," Schmitt, *Proc. Cal. Acad. Sci.*, ser. 4, vol. 13, no. 24, 1924, p. 384.

General Range: So far only recorded from the Gulf of California. A littoral form.

Local Distribution: A total of 14 specimens (Cat. No. 36,808) was taken off Arena Bank (Station 136 D-33) in coral (*Pocillopora ligulata*) at a depth of 2½ fathoms.

Sex and Size: This entire series of 8 males and 6 females is composed of adolescents and juveniles. The largest specimen, a male, has the following dimensions: length of carapace 6 mm., width 5.7 mm. As neither Lockington nor Schmitt has given the dimensions of their specimens, I will give the measurements for normal adults, collected by myself, at the following localities: Adult female from Conception Bay (near type-locality), Baja California, Mexico, January 20, 1932: length of carapace 10 mm., width 11 mm. Adult male from San Pedro Bay, Sonora, Mexico, December 25, 1931: length of carapace 10 mm., width 9.7 mm.

Color: This species is not nearly as highly colored in life as it is in alcohol, the preservative intensifying the coloration for a considerable time. In life it is a light red mottled with cream, spines and lobes, yellow to white margined with a deep red; the undersides of the hands are very conspicuous, a bright pink.

Habitat: It is usually found in the inter-tidal zone, beneath rocks.

Remarks: The collection of this series is the first indication that the species may be obtained at a depth, as it has heretofore been taken only in the tidal zone.

Petrolisthes crenulatus Lockington.

Petrolisthes crenulatus Lockington, *Ann. Mag. Nat. Hist.*, ser. 5, vol. 2, 1878, p. 398 (type-locality, Port Escondido, Baja California, Mexico).

General Range: Gulf of California.

Local Distribution: 2 specimens (Cat. No. 36,810) were taken off Arena Bank (Station 136 D-33) in coral (*Pocillopora ligulata*) at a depth of 2½ fathoms.

Sex and Size: The specimens are male and female adolescents. The male, which is the larger, has length of carapace 6 mm., width 6 mm. Adult specimens of this species are much larger than the above. A male, collected by the author at the type-locality, has the following measurements: length 13.5 mm., width 15 mm.

Color in Life: This is a large and very distinctive species; its color of cream and orange-red makes it conspicuous.

Habitat: It is usually found in the lower part of the inter-tidal zone under stones.

Remarks: Lockington described this species from a single immature specimen (sex not given). The number of teeth on the anterior margin of the carpus is subject to variation; three or four may be present. This is the first record of this species having been taken outside of the inter-tidal zone.

Petrolisthes polymitus Glassell, sp. nov.

(Plate I; Figure 1).

Type: Male, holotype; Cat. No. 36,918, Department of Tropical Research of the New York Zoological Society; Station 136, Dredge 33; from the Gulf of California off Arena Bank, 25° 26' N. Lat., 109° 24' 30" W. Long.; 2½ fathoms; May 2, 1936; in coral (*Pocillopora ligulata*); collected by William Beebe on the Templeton Crocker Expedition. Deposited in the collection of the New York Zoological Society.

Diagnosis: Carapace with wide, flattened, transverse plications, those posterior to the cardiac region extending across the carapace and joined in pairs at the median line; a single forward-pointing spine on the shoulder. Front serrate, not trifid. Chelipeds unequal; carpus four- or five-spined; dactyli with a single, distal spine, at termination of upper crest, extending forward over curved tip of dactylus; outer margin of hand spinose.

Description: Carapace slightly longer than wide, depressed, the surface crossed with wide, flattened, transverse plications, anteriorly interrupted by the gastro-cardiac regions and the cervical groove; those plications posterior to the cardiac region, four in number, are entire, though joined in pairs at the median line. A verticil on each side of the cardiac region, and a pit on each side of the proximal end of the mesogastric region; a longitudinal, narrow, median sulcus extends back some distance on the gastric region; this sulcus divides a transverse ridge extending between the bases of the upper ocular spines, and the protogastric ridge lying behind it. The front is broadly triangular, apex slightly depressed, margin minutely serrate; the upper surface on each side of the median sulcus to the distal ocular hiatus is obliquely plicate. The upper ocular margin is armed with a single, long, sharp, forward-pointing spine. The lateral margin of the carapace is armed with a single, sharp-pointed spine on the shoulder behind the cervical groove. The eyes are large and stout. The basal joint of the antennae is armed subdistally with a prominent spine; the second peduncle is stout, short and unarmed; the third peduncle is almost globular, with less diameter than that of the second.

Chelipeds subsimilar, unequal; merus with an inner distal upward-pointing spine and two small carpal-articulation spines; carpus, including spines, more than half as wide as long, armed with four or five sharp-pointed, serrated spines on inner margin; upper surface obliquely plicated with squamous tubercles; the outer margin is armed distally with a row of three or four sharp spines; the hands are unequal, subsimilar, stout, armed on their outer margin from near the proximal end to the base of the pollex with a row of well-separated, forward-pointing, small, sharp spines; from the distal spine of this series to the upturned tip of the pollex, the margin is serrated with a fine beading; the inner margins of the hands are lightly beaded; the surface of the outer half of the hands is covered with granulations and small squamous tubercles. The median ridge of the major hand is composed of granular-edged plications which form an obtuse angle at the median line, thence run obliquely and entire to a point near the inner border of the hand; these plications differ in the minor hand, in that they are not entire, but broken up into separate rugae; the interspaces between plications and granules are filled with a microscopic pile, only to be seen under a lens. The dactyli of both hands are armed at the distal end of their upper crest with a single, sharp, outward-pointing spine, as in some species of the

Galatheidae. The fingers of the major hand gape from base to crossing tips, those of the minor hand fit closely together; on the under side of both hands within the gape of the fingers is a close pile of tomentum; the under surface of the hands is lightly granular on the inner half, punctate on the outer.

The ambulatory legs are stout, with a few scattered setae; merus with a small, subdistal spine on upper crest; the dactyli are long, sharp, compressed, and curved only at the corneous tip, their length is slightly more than half the propodal length, they are armed on their lower margin with a row of short spines.

The telson of the abdomen is composed of seven plates. The ischium and merus of the outer maxillipeds are transversely plicated with red striations.

Color in Alcohol: This beautiful little crab has the appearance of being embroidered in colored silks, somewhat similar in effect to the Peking stitch; the plications are an orange-red, laterally merging into a yellow on the median line; the subcardiac whorls, protogastric and frontal ridges are a deep red. The under side of the chelipeds is a brilliant carmine, mottled with white. The propodi of the ambulatories are distally banded with mottled carmine. The median line of the abdomen is paralleled with red chromatophores, blending into orange. The hands give the impression of being banded with orange and white.

Measurements: Male holotype, length of carapace 5 mm., width 4.8 mm.; carpus length 4 mm., width including spines 2.5 mm.; length on hands 7 mm., width of major hand 2.9 mm., of minor hand 2.4 mm.

Material Examined: The holotype. This specimen had the third left leg and the first right leg regenerating.

Habitat: Collected in 2½ fathoms in coral (*Pocillopora ligulata*). Associated with *P. hirtispinosus* Lockington.

Remarks: This proposed species is allied to *P. hirtispinosus* Lockington, 1878, but differs from that species by having the carapace plicated, instead of not plicated, by being nearly free from tomentum, instead of being covered with a fine pile of pubescence. It is allied to *P. felipensis* Glassell, 1936, but differs from that species by having the plications continue entire across the carapace posterior to the cardiac region instead of not being continued and by there being a single spine at the termination of the cervical groove, instead of a row of spines continued onto the carapace at this point. Both *P. felipensis* and *P. polymitus* have the peculiar sub-bifid-tipped dactyli of the chelipeds, a unique characteristic.

Genus *Pisosoma* Stimpson.

Pisosoma flagraciliata Glassell, sp. nov.

(Plate I; Figure 2)

Type: Female, holotype; Cat. No. 36,919, Department of Tropical Research of the New York Zoological Society; Station 136, Dredge 33; from the Gulf of California off Arena Bank, 25° 26' N. Lat., 109° 24' 30" W. Long.; 2½ fathoms; May 2, 1936; in coral (*Pocillopora ligulata*); collected by William Beebe on the Templeton Crocker Expedition. Type deposited in the collections of the New York Zoological Society.

Diagnosis: Carapace sculptured anteriorly, about as long as wide. Antennae with flagellum ciliate. Chelipeds short, stout, naked. Ambulatory legs stout, with sparse setae.

Description: Carapace about as long as wide, with regions well-defined anteriorly, with branchial, hepatic and protogastric prominences separated by grooves; the posterior half much smoother, polished, lightly punctate and with light lateral plications. The front in a dorsal view is strongly

arched, sinuous in a front view, with a triangular median tip. Eyes large, stalks stout. Antennal peduncles stout; the first peduncle with two minute spines on its outer, distal face; the second peduncle with a single spine at its outer distal end; the flagellum is ciliated at its joints, those on the anterior side being longest.

Chelipeds short, stout, naked; merus short on dorsal side with a very narrow margin, armed with a small, subvertical lobe on the distal, inner end; the ventral margin extending to this lobe is serrated at the carpal articulation, and flattened for the reception of the hand when flexed; the carpus is nearly as wide as long, flattened on the upper surface, and armed on its inner, arcuate margin with three or four large, subtriangular teeth, the proximal the largest; a tumid ridge extends from the proximal end to a point near the distal end, its anterior, imperceptible border being on the median line; its posterior border is a deep sulcus paralleling the rounded, obliquely plicated, outer margin; the surface of the carpus is transversely plicated from the anterior base of the obliquely plicated ridge to the inner margin; the flexed hand fits into a concavity underneath the thin, toothed, inner edge of the carpus; the hands are thick, stout, subequal but dissimilar; a distinct sulcus parallels the outer margin to a point near the tip of the pollex; the upper surface is granulous, the under slightly punctate; the fingers of the major chela are gaping, their tips blunt and crossing; those of the minor hand are straighter, lightly toothed, and joining from gape to crossed tips.

Ambulatory legs stout and lightly setose; their dactyli are strong, curved, corneous, and are half the length of their propodi. The abdominal telson is composed of five plates.

Sexual Variation: The carapace of the males is slightly longer than wide.

Color in Alcohol: Carapace with a ground color of red; plications red and white. Chelipeds with maroon blotches, the plications banded with red and white; the fingers red with white tips. Ambulatory legs banded with red and white.

Measurements: Female holotype (the largest of the series), length of carapace 4.9 mm., width 5.1 mm.; length of carpus 3.4 mm., width 3 mm. Male paratype, length 4.2 mm., width 4 mm.

Material Examined: A series of 18 specimens (Cat. Nos. 36,919 and 36,920), equally divided as to sex, mostly juveniles, the females nearly all ovigerous. The types were selected from this series.

Habitat: Collected in coral (*Pocillopora ligulata*) at a depth of 2½ fathoms. Associated with *P. sinuimanus* Lockington, *Pachycheles biocellatus* (Lockington), and *Pachycheles sonorensis* Glassell.

Remarks: This proposed species is allied to *P. serrata* Benedict, 1900, but differs in the carapace, the anterior regions being prominent, instead of nearly smooth, by the chelipeds being more nearly equal, instead of very unequal, and by the presence of a deep paralleling sulcus following the outer, obliquely plicated border.

This species, like *P. lewisi* Glassell, 1936, has the flagellum of the antennae ciliated, but unlike the latter, the cilia are more pronounced.

In general appearance, the chelipeds in this species greatly resemble those of the genus *Pachycheles*. In this species, however, the epimera are posteriorly entire.

Pisosoma sinuimanus Lockington.

Petrolisthes (Pisosoma) sinuimanus Lockington, *Ann. Mag. Nat. Hist.*, ser. 5, vol. 2, 1878, p. 401 (type-locality [?], La Paz and Port Escondido, Lower California, Mexico; types not extant).

Petrolisthes sinuimanus (Lock.), Nobili, *Boll. Mus. Zool. Anat. comp. R. Univ. Torino*, vol. 16, no. 415, 1901, p. 15 (Isle of Flamenco, Ecuador).
—Rathbun, *Proc. U. S. Nat. Mus.*, vol. 38, 1910, p. 599.

General Range: Gulf of California; Ecuador (Nobili).

Local Distribution: 8 specimens (Cat. No. 36,812) were taken off Arena Bank (Station 136 D-33) in coral (*Pocillopora ligulata*); at a depth of 2½ fathoms.

Sex and Size: The series includes 2 males and 6 females. The largest specimen, a male, has the following measurements: length of carapace 4.5 mm., width 4.3 mm.

Color in Life: In color this species varies from a light cream to buff; the ventral side is slightly iridescent.

Habitat: It is found throughout the Gulf of California, in the intertidal zone, on the under side of rocks.

Remarks: This is the first recorded collecting of this species below the tidal zone.

Genus *Pachycheles* Stimpson.

Pachycheles biocellatus (Lockington).

Petrolisthes (Pisosoma) biocellatus Lockington, *Ann. Mag. Nat. Hist.*, ser. 5, vol. 11, 1878, p. 403 (exact type-locality unknown. Lower California).

Pisosoma aphrodita Boone, *Zoologica*: N. Y. Zoological Soc., vol. 14, no. 1, 1932, p. 53, fig. 17, a-b (type-locality, off Hood Island, Galápagos).

This species, as recorded by Lockington, was collected somewhere on the peninsula of Lower California, and described by him from two specimens, sex not being given. These specimens, the types, were destroyed in the San Francisco fire of 1906.

From a careful analysis of Lockington's description, I am convinced that a typographical error exists in the one measurement he records: "The larger of the two specimens measures barely three centimetres in length." He then states in another paragraph: "This pretty little species is a typical *Pisosoma*." If we interpret Lockington's word "centimetres" to mean millimetres, then the sense of his statement "This pretty little species," etc., becomes apparent, for by no stretch of the imagination would a porcellanid with a length of three centimetres be considered diminutive. When we assume that Lockington was in reality working on juvenile specimens, it is not to be wondered at that he selected the genus *Pisosoma*, instead of *Pachycheles*, as it would have been difficult for him to have determined, assuming also that he had dried specimens, that the epimera of the carapace is posteriorly broken up, with the posterior subquadrate part separated by a cutaneous inter-space from the remainder.

From a series of 17 specimens collected off Arena Bank, Gulf of California, Mexico, I propose to designate one female the neotype and one male the allotype.

Neotype: Female; Cat. No. 36,821, Department of Tropical Research of the New York Zoological Society; Station 136, Dredge 33; off Arena Bank, 25° 26' N. Lat., 109° 24' 30" W. Long.; 2½ fathoms; May 2, 1936; in coral (*Pocillopora ligulata*); collected by William Beebe on the Templeton Crocker Expedition. Neotype deposited in the collections of the New York Zoological Society.

Allotype: Male; Cat. No. 36,822, Department of Tropical Research of the New York Zoological Society; collected at the same place and time as the neotype. Allotype deposited in the collections of the New York Zoological Society.

Diagnosis: Carapace depressed, broader than long, punctate, polished, naked, carmine, with white spots on the shoulders and white lunet beside the cardiac region. Chelipeds short, heavy, naked, subequal; inner margin of carpus arcuate, unarmed. Telson of abdomen with five plates.

Description: Carapace broadly wide at the shoulders, wider than long, transversely depressed, convex fore and aft; regions lightly outlined, a reversed lunet on each side of the cardiac region; the protogastric ridges have their apices on the median line, from whence they curve backward and outward; the lateral margin is lightly plicate, more prominent posteriorly; the front is slightly arched, with a small depressed lobe forming the inner terminus of the upper ocular margin; the postorbital spine is acute. The first antennal peduncle is armed on its anterior margin with a triangular lobe; the others unarmed; flagellum naked.

Chelipeds very stout, short, subequal, lightly punctate, naked; merus with upper surface lightly, transversely plicate, a laminate, subhorizontal, triangular, inner, distal lobe, its distal end passing the carpal hinge; the carpus is nearly as wide as long, the upper anterior portion produced forward as a thick lamina; this margin is strongly arched, unarmed, sinuous, and indistinctly divided into three lobes, more prominent in the juveniles than in the adults; the outer margin is obliquely plicate, with a short distal spine; the hands are subequal, short, stout, naked, with the surface polished and lightly punctate; inner margin smooth, outer margin with a deep, distinct sinus paralleling the margin from base to near the blunt tip of pollex; fingers of major hand gaping, of minor hand not gaping; pollices of both hands bidentate near their inner apices, more noticeable in the minor chela.

Ambulatory legs heavy, with scattered setae, sparse on merus, more plentiful on carpus and propodus; dactyli long, curving at corneous tip, the underside with a row of three short, straight spines. Telson of abdomen with five plates.

Sexual Variation: The carapace of the females is broader than that of the males.

Color in Life: Ground color of carapace and chelipeds carmine (Ridgway Color Standards). The carapace has distinctive white spots on the shoulders and smaller spots on the lunets opposite the cardiac region. The finger tips of the hands are white, as are the proximal upper ends of the meri of the ambulatories.

Measurements: Female neotype, length of carapace 5.8 mm., width 6.7 mm. Male allotype, length 5.5 mm., width 5.5 mm.

Range: From the Gulf of California to the Galápagos Islands. In the Gulf of California, this species has been taken only at the lower end of the peninsula of Lower California, up to 24° N. Lat.

Material Examined: A series of 17 specimens (Cat. Nos. 36,811, 36,821, and 36,822), 7 males and 10 females, collected by William Beebe off Arena Bank, Lower California, Mexico (Station 136 D-33), May 2, 1936, in 2½ fathoms, in coral (*Pocillopora ligulata*). The neotype and allotype were selected from this series. Through the kindness of the New York Zoological Society, I also examined the type specimens of *Pisosoma aphrodita* Boone, and find them to be conspecific. Hence I have suppressed the latter name as a synonym.

Habitat: Found under coral and sponge-incrusted stones from mean low tide to a depth of 3 fathoms.

Remarks: This unique species may be instantly recognized by its vivid coloring. I know of no other species in the genus with the inner carpal margin so smooth. The specimens taken in the Gulf of California are not incrusted with extraneous matter as are those reported by Boone from the Galápagos.

Pachycheles marcortezensis G'assell.

Pachycheles marcortezensis Glassell, *Trans. San Diego Soc. Nat. Hist.*, vol. 8, no. 21, 1936, p. 290 (type-locality, SE. end of Angel de la Guardia Is and, Gulf of California, Mexico).

General Range: Previously recorded only from the type-locality, in 20 fathoms.

Local Distribution: A male and a female (Cat. No. 36,807) were taken from Arena Bank (Station 136 D-23) at a depth of 40 fathoms, on a bottom composed of mud and shells.

Sex and Size: Of the two specimens taken the female measures: length of carapace 4.5 mm., width 5 mm.; the measurements of the male are, length 4.8 mm., width 5 mm.

Color in Alcohol: Red mottled with white, the bristles a straw color.

Habits, Habitat: This species frequents a rather rough bottom, where it is able to secure shelter.

Remarks: This is an extension of geographic range, being a new locality record several hundred miles from the type-locality. It is also an extension of bathymetric range from 20 to 40 fathoms.

Pachycheles sonorensis G'assell.

Pachycheles sonorensis Glassell, *Trans. San Diego Soc. Nat. Hist.*, vol. 8, no. 21, 1936, p. 291 (type-locality, Miramar Bay, near Guaymas, Sonora, Mexico).

General Range: Gulf of California. Low tide to 2½ fathoms.

Local Distribution: A total of 9 specimens (Cat. No. 36,809) was taken off Arena Bank (Station 136 D-33) in coral (*Pocillopora ligulata*) at a depth of 2½ fathoms.

Sex and Size: The collection numbers 3 males and 6 females. The largest specimen, a female, has the following measurements: length of carapace 7 mm., width 7.5 mm.

Color in Alcohol: The ground color of this species is a pink-tinted cream overlaid with numerous, small, red, irregular spots; lighter on the ventral side, but still spotted.

Habits, Habitat: Like most of the members of the genus *Pachycheles*, they are sluggish in their movements. They seek shelter on a moss-, sponge- and coral-incrusted bottom.

Remarks: This is a new locality record for this species, extending its range several hundred miles. The finding of these at a depth of 2½ fathoms also indicates that the natural habitat is subtidal, which accounts in a great measure for the species having been overlooked at other collecting stations in the Gulf of California by previous expeditions.

Genus *Porcellana* Lamarck, restricted Stimpson.*Porcellana cancrisocialis* Glassell.

Porcellana cancrisocialis Glassell, *Trans. San Diego Soc. Nat. Hist.*, vol. 8, no. 21, 1936, p. 292 (type-locality, Punta Peñasco, Sonora, Mexico).

General Range: Gulf of California to Magdalena Bay, Lower California.

Local Distribution: 2 young males (Cat. Nos. 36,804 and 36,805) were taken from Arena Bank (Station 136, D-5 and D-6, respectively) at depths of 33 and 35 fathoms, on sandy bottoms with weed.

Color: This species in life is very colorful; the colors in alcohol are fugitive. In life the ground color is an ivory yellow, overcast with lavender and blood-red spots; the ambulatories have their propodi banded with white.

Habits, Habitat: It is commensal in habit, having been found living with a large hermit crab. In this, however, it no doubt is not restricted to a single species of host.

Remarks: While not an extension of geographic range this recording is a considerable extension of bathymetric range, from the inter-tidal zone to a depth of 35 fathoms.

Porcellana paguriconviva Glassell.

Porcellana paguriconviva Glassell, *Trans. San Diego Soc. Nat. Hist.*, vol. 8, no. 21, 1936, p. 293 (type-locality, Punta Peñasco, Sonora, Mexico.)

General Range: Gulf of California.

Local Distribution: A single male (Cat. No. 36,813) was taken from Santa Inez Bay (Station 141 D-2) at a depth between 10 and 15 fathoms, on a bottom composed of muddy sand and crushed shell.

Sex and Size: A male, uncalcified, with the following dimensions: length of carapace 5 mm., width 4.8 mm. The specimen shows distortion, due to its soft state.

Color in Life: This species, like *P. cancrisocialis* Glassell, is of very vivid coloration; ground color, in longitudinal stripes, a bright lavender, a uniform design of bright orange overlaid on this; chelipeds same as carapace, but not patterned; legs with a white spot on propodus. Ventral side iridescent, with longitudinal pattern of carapace continued on first three segments of abdomen.

Habits: This species is commensal with a large hermit crab.

Remarks: This records a new locality record for this species, and also indicates that the species is not strictly an inter-tidal form, in this instance having been collected at a depth of 10 to 15 fathoms.

Porcellana hancocki Glassell, manuscript name.

Material: A total of 3 specimens was taken from Arena Bank (Station 136), and Santa Inez Bay (Stations 142 and 146), between 35 and 40 fathoms on muddy and sandy bottoms.

The specimens were distributed as follows:

Station 136: D-18 (1 male); 40 fathoms; (Cat. No. 36,806).

Station 142: D-3 (1 male); 40 fathoms; (Cat. No. 36,814).

Station 146: D-1 (1 female); 35 fathoms; (Cat. No. 36,923).

EXPLANATION OF PLATE.

PLATE I.

Fig. 1. *Petrolisthes polymitus*, male holotype, length 5 mm., dorsal view.

Fig. 2. *Pisosoma flagraciliata*, female holotype, length 4.9 mm., dorsal view.